THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

UNIVERSITY EXAMINATIONS FOR DEGREE IN BACHELOR OF SCIENCE IN CIVIL ENGINEERING

ECE 2406 : FOUNDATION ENGINEERING I

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Scientific calculator*
- *Drawing instruments*

This paper consists of **FIVE** questions in **TWO** sections **A & B**
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

SECTION A (*COMPULSORY – 30 MARKS***)**

Question 1

a) State any TWO assumptions of :
   (i) Coulomb earth pressure theory (3 marks)
   (ii) Rankine earth pressure theory (3 marks)

b) A sheet piled wall retains 4.5 m of soil as shown below. Calculate the active and passive earth pressure at depths of 0m , 6m and 9m below the surface.

1.5M

Fig 1.0

SECTION B (*Answer any TWO questions from this section***)**

Question 2

a) Illustrate the following modes of failure

(i) General shear failure
(ii) Local shear failure
(iii) Punching shear failure (6 marks)

b) A square footing located at a depth of 1.3m below ground has to carry a safe load of 800KN. Find the size of footing if the desired factor of safety is 3. Use Terzaghi's analysis for general shear failure. Take c = 8kPa, N_c = 37.2 , N_q = 22.5, N = 19.7 and = 18kN/m^3

Question 3

a) State at least SIX reasons for carrying out site investigations (3 marks)

b) Briefly explain the following boring methods
(i) Wash Boring
(ii) Percussion Boring
(iii) Rotary Boring (9 marks)

c) Explain why the following types of site investigations surveys are necessary
(i) Reconnaissance survey
(ii) Preliminary survey
(iii) Detailed survey (6 marks)

d) Differentiate between disturbed soil samples and undisturbed soil samples (2 marks)

Question 4

a) Define the following terms
   (i) Co-efficient of compressibility
   (ii) Co-efficient of volume change
   (iii) Compression index (6 marks)

b) A 3m thick layer of silty clay is sandwiched between two layers of dense sand
   The effective overburden pressure at the centre of the silty clay layer is $2kg/cm^2$. However, due to the construction of a raft foundation, this pressure increases to $4kg/cm^2$.

   Laboratory consolidation test was performed under applied stresses of $2kg/cm^2$ and $4kg/cm^2$ the compressions of the sample were found to be 0.26cm and 0.38cm respectively. Compute the probable settlement of the raft (14 marks)

Question 5

a) Explain the following terms.

   (i) Base failure
   (ii) Toe failure
   (iii) Face failure (6 marks)

b) A 10m high cutting has a slope 40^o to the horizontal. The soil was tested and its cohesion void ratio and angle ϕ were found to be $2.5t/m^2$, 0.81 and 14^o respectively. Determine the factor of safety with respect to cohesion against failure of the slope.

   (i) When water level rises up to the full height
   (ii) When water level goes down suddenly

   Given: G = 2.7 and for 40^o slope values of stability for different values of ϕ

ϕ	N
6^o	0.122
7^o	0.116
14^o	0.074

(14 marks)